



To Study the Significant Difference in the Average Yields of Plots of Land under the Use of Six Varieties of Fertilizers in the State of Punjab, India

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Abstract

This paper relates to the study of significant difference in the average yields of plots of land under the application of six different fertilizers which are in organic in nature .The land is divided into sixty six plots of land in the state of Punjab on which this research has been carried out. The study revealed that the difference in the average yields of the plots of land under the six varieties of fertilizers is significant.

Keywords:-fertilizer, crops, yield, nutrients, land

INTRODUCTION:-

Crop production has increased drastically over the last few decades, much of which has been due to the widespread introduction of organic and inorganic fertilizers starting in the mid-1900s. Matching fertilizer application rates to crop needs is an essential, components of optimizing crop production (Chadha, 1981). Soil Amendments are made by adding fertilizer to the soil but there are different types of fertilizer. There are bulky organic fertilizers such as cow manure, bat guano bone meal, organic compost and green manure crops (Dyal, 1985). And then there is an also chemical fertilizer which is also referred to as inorganic

fertilizer and is made up with different formulations to suit a variety of specified uses. Though many government and agricultural department go to great lengths to increase the supply of organic fertilizers such as bulky organic manure and composting materials there is just not enough of these fertilizers available to meet the existing and future fertilizer needs. (Malhi,1985). Compared to organic compost, chemical or inorganic fertilizers also have the added advantage of being bulky being less bulky makes chemical fertilizer easier to transport, both overland and from the soil into the plants itself, because they get to be available to the plant reliably quickly when incorporated as part of the plant-food constituents. Chemical fertilizers as a rule come in either granular or powder form in bags and boxes, or in liquid formulations in bottles (Sharma,1995). The different types of chemical fertilizers are usually classified according to Nitrogen (N) Phosphorous (P) Potassium (K) sulphur (S) Zinc (Zn) Magnesium (Mg). However, different crops in separate fields will require varying rates of the major nutrients –nitrogen (N_2) phosphate (P_2O_5) and Potassium (Potash, K_2O), Sulphur (S) Magnesium (Mg) and Zinc (Zn) to variations in soil types, soil test phosphorous and potassium levels, and nutrient ranges of different crops. Meeting these N-P₂O₅-K₂O (sometimes abbreviated to N-P-K) requirements without over applying any of these nutrients is possible by blending various types of fertilizers to give correct N-P₂O-K₂O ratio. Thus allows you to apply the correct rate of particular blended fertilizers. This publication covers the use of inorganic fertilizers, sometimes referred to as commercial or chemical fertilizers to supply the major crop nutrients N_2 , P_2O_5 , K_2O , S Mg and Zn to the cropping crop yields (Singh, 1990). However some such test in the country has suggested different doses of N P K for crop yield under different soil conditions.

Mallick et.al.1985, Dyal and Mishra 1985, Malhi and Nijjar, 1985. The present studies on the fertilizers requirements on plots of land to the corresponding yield of crops were carried out in the state of Punjab. The types of fertilizers, However used on 66 plots of land.

Hypothesis:-Null Hypothesis:-

H₀: There is no significant difference in the average yields under the six varieties of fertilizers.

Objective: -

1. To Study the average yields of plots of land.
2. To study whether there is significant difference in the average yields under the six varieties of fertilizers.

Research methodology: -

The northern states of Punjab, Haryana and Uttar Pradesh (western districts) represent India's granary and contribute greatly to the wheat reserves of the country. Field experiments on six varieties of fertilizers on the wheat (cv. PBW-138 suited for late-sown conditions and cv. HD-2329, a high yielding variety also often adapted for late-sown conditions). The test soil was a sandy loam Typic Ustochrept low in available N and organic carbon (0.34 percent) and medium in available P (22 kg/ha) and K (136 kg/ha). Wheat was sown late (January 6), thereby establishing a higher plant population than obtained with the, which encompasses the fertile Indo- Gangetic alluvial plain, is capable of producing above average wheat yields

Selecting Fertilizer and Method of Applications:-

Phosphate, magnesium, sulphur, Zinc and K₂O can be land-applied at any time, but normally it is more cost-effective to apply at the same time as N. However, N is more mobile than P₂O₅ and K₂O in the soil and should be applied as closely as possible to the time of crop uptake. Nitrogen in the form of nitrate can be lost from soils via leaching and can be denitrified to N gas in reducing conditions, such as soils saturated with water.

Table:-1 Yield (quintal) on sixty six plots of land in six samples, each of 11 plots, under six varieties of fertilizers.

S.N.	Nitrogen(N)	Phosphorus(P)	Potassium(K)	Sulphur(S)	Zinc(Zn)	Magnesium(Mg)
	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆
1	18	19	21	22	28	24
2	21	26	23	32	23	30
3	23	28	24	34	21	32
4	25	21	25	30	24	34
5	27	31	21	31	28	26
6	29	30	20	29	23	24
7	31	29	19	27	27	22
8	32	33	17	28	29	21
9	19	18	18	20	24	18
10	17	19	22	24	26	19
11	20	22	26	21	30	27
Total	$\sum X_1 = 262$	$\sum X_2 = 276$	$\sum X_3 = 236$	$\sum X_4 = 298$	$\sum X_5 = 283$	$\sum X_6 = 277$
Mean	$\sum X_1/n = 23.81$	$\sum X_2/n = 25.09$	$\sum X_3/n = 21.45$	$\sum X_4/n = 27.09$	$\sum X_5/n = 25.72$	$\sum X_6/n = 25.18$
App	=24	=25	=21	=27	=26	=25

Grand mean (\bar{X}) = 24.66 = 25 (Round off)

Sum of square between the samples:-

$$= \sum n_i (\sum X_{1/n} - \bar{X})^2 + \sum n_i (\sum X_{2/n} - \bar{X})^2 + \sum n_i (\sum X_{3/n} - \bar{X})^2 + \sum n_i (\sum X_{4/n} - \bar{X})^2 + \sum n_i (\sum X_{5/n} - \bar{X})^2 + \sum n_i (\sum X_{6/n} - \bar{X})^2$$

$$= 6(24-25)^2 + 6(25-25)^2 + 6(21-25)^2 + 6(27-25)^2 + 6(26-25)^2 + 6(25-25)^2$$

$$= 132$$

$$Y_1 = d.f = 6 - 1 = 5$$

$$\text{Mean square between the samples (MSB)} = 132/5 = 26.4$$

Calculation for sum of the squares within the samples (SSW)

$$\begin{aligned} \text{SSW} &= \sum (\text{X}_1 - \sum \text{X}_1/n)^2 + \sum (\text{X}_2 - \sum \text{X}_2/n)^2 + \sum (\text{X}_3 - \sum \text{X}_3/n)^2 + \sum (\text{X}_4 - \sum \text{X}_4/n)^2 + \sum (\text{X}_5 - \sum \text{X}_5/n)^2 + \sum (\text{X}_6 - \sum \text{X}_6/n)^2 \\ &= 284 + 297 + 85 + 223 + 85 + 352 \\ &= 1326 \end{aligned}$$

$$\gamma_2 = \text{d.f} = 66 - 6 = 60$$

$$\text{Mean square within the samples (MSW)} = 1326/\gamma_2 = 1326/60 = 22.1$$

Analysis of variance (ANOVA) Table:-2

Source of variation	Sum of squares(SS)	Degrees of freedom(d.f.)	Mean squares (MS)	Test statistics
Between samples	132	5	26.4	
				F=26.4/22.1=1.194
Within samples	1326	60	22.1	
		65=N-1		

$$F(\text{test}) = \text{MSB}/\text{MSW} = 26.4/22.1 = 1.194$$

Conclusion/Results:-

The study of significant difference in the average yields of plots of land under the application of six different fertilizers which is in organic in nature. The land is divided into sixty six plots of land in the state of Punjab on which this research has been carried out. The study revealed that the difference in the average yields of the plots of land under the six varieties of fertilizers is significant. From the table given above the value of F for $\gamma_1 = 5$ and $\gamma_2 = 60$ at 5% level is 2.37. We see

that the calculated value 1.194 is smaller than the tabulate value 2.37. Hence, we accept the null hypothesis at 5% level and conclude that the difference in the average yields of the plots of land under the six varieties of fertilizers is significant.

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